COSEWIC
Status Appraisal Summary

on the

Grass Pickerel
Esox americanus vermiculatus

in Canada

SPECIAL CONCERN
2014

COSEWIC
Committee on the Status
of Endangered Wildlife
in Canada

COSEPAC
Comité sur la situation
des espèces en péril
au Canada

COSEWIC status appraisal summaries are working documents used in assigning the status of wildlife species suspected of being at risk in Canada. This document may be cited as follows:

COSEWIC. 2014. COSEWIC status appraisal summary on the Grass Pickerel *Esox americanus vermiculatus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xix pp. (www.registrelep-sararegistry.gc.ca/default_e.cfm).

Production note:
COSEWIC acknowledges Julia Colm and Nick Mandrak for writing the status appraisal summary on the Grass Pickerel, *Esox americanus vermiculatus* in Canada, prepared under contract with Environment Canada. This status appraisal summary was overseen and edited by Rick Taylor, Co-chair of the COSEWIC Freshwater Fishes Specialist Subcommittee.

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Également disponible en français sous le titre Sommaire du statut de l'espèce du COSEPAC sur le Brochet vermiculé (*Esox americanus vermiculatus*) au Canada.

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Catalogue No. CW69-14/2-43-2015E-PDF
ISBN 978-1-100-25621-4

COSEWIC
Assessment Summary

Assessment Summary – November 2014

Common name
Grass Pickerel

Scientific name
Esox americanus vermiculatus

Status
Special Concern

Reason for designation
This fish is known from relatively few locations from southern Lake Huron to western Quebec. The subspecies has a scattered distribution in Canada and is not abundant in any area. The subspecies could become threatened if habitat quality continues to decline owing to changes in land use and invasive species.

Occurrence
Ontario, Quebec

Status history
Designated Special Concern in May 2005. Status re-examined and confirmed in November 2014.

COSEWIC
Status Appraisal Summary

Grass Pickerel — Brochet vermiculé
Esox americanus vermiculatus
Range of occurrence in Canada: Ontario, Québec

Current COSEWIC Assessment:

Designated Special Concern in May 2005. Status re-examined and confirmed in November 2014.

Evidence (indicate as applicable):

Wildlife species:

Change in eligibility, taxonomy or designatable units: yes ☐ no ☒

Explanation:

No new data to support a change or reason to think that there should be any change.

Range:

Change in extent of occurrence (EO): yes ☒ no ☐ unk ☐
Change in index of area of occupancy (IAO): yes ☒ no ☐ unk ☐
Change in number of known or inferred current locations: yes ☒ no ☐ unk ☐
Significant new survey information: yes ☒ no ☐

Explanation:

The extent of occurrence and index of area occupancy have increased in the last 10 years relative to the 10-year period before the last status report (Fig. 1-3); however, the recent increase is due to increased sampling effort and both values are lower than longer-term historical records. The Grass Pickerel is known from at least 14 Ontario locations and 1 Québec location where each location is defined by the most plausible threat across one or more site occurrences (see Table 1).

Population Information:

Change in number of mature individuals: yes ☐ no ☐ unk ☒
Change in population trend: yes ☐ no ☐ unk ☒
Change in severity of population fragmentation: yes ☐ no ☐ unk ☒
Change in trend in area and/or quality of habitat: yes ☐ no ☒ unk ☐
Significant new survey information: yes ☒ no ☐

Explanation:

Preliminary data from DFO sampling efforts in Beaver Creek (a tributary of the Niagara River) suggest a decline in the number of mature Grass Pickerel over the last 5 years, from several thousand in 2009 to hundreds in 2013 (DFO, unpubl. data). Although drain maintenance has occurred in the creek, the decline may be due, in part, to natural drought conditions or other unknown variables, but further analysis is needed

to verify the decline (Colm 2013). This potential decline in mature individuals is mirrored in other Ontario populations. Recent targeted sampling efforts by DFO in Twenty Mile Creek (western Lake Ontario) and Jones Creek (St. Lawrence River) resulted in only a few individuals compared to many caught in the 1990s (Royal Ontario Museum, unpubl. data) and 1960s (Crossman 1962), respectively, for each creek. The magnitude of these potential declines, however, is not yet possible to quantify. Sampling as recent as 2009 continues to fail to detect Grass Pickerel at sites of historical occurrence in the Lower Grand River (Crossman and Holm 2005; Beauchamp *et al.* 2012). Sampling efforts undertaken in the Severn River system (OMNRF), Long Point Bay (DFO, OMNRF), St. Clair drains (DFO), and eastern Lake Ontario and the St. Lawrence River (DFO, OMNRF, Muskies Canada, Parks Canada) suggest that the subpopulations are small, but there has been little apparent change in the number of mature individuals in the last 10 years. Until 2014, Grass Pickerel had not been detected in Québec since 1988 (DFO, AECOM, unpubl. data). In the summer of 2014, 30 specimens, mainly juveniles, were caught in six southern tributaries to Lake St. Francis (Rivière aux Saumons, Ruisseau Pike, Ruisseau McMillan, Ruissera Fraser/Brunson, Ruisseau MacPherson, and Ruisseau sans nom) (DFO, AECOM, unpubl. data). In 2014, Queen's University extensively sampled the historical sites in the Severn River watershed and caught only 10 individuals (including six at one site (Grass Lake) (Colm, unpubl. data). Further information is needed from other subpopulations to estimate the number of mature individuals and whether this number is changing relative to historical estimates.

The concept of severe fragmentation (*sensu* IUCN) was not applied during the last assessment of this species in 2005. Currently, there are insufficient data to quantitatively assess whether or not the Grass Pickerel is severely fragmented, i.e., population sizes are generally unknown and the size at which an individual Grass Pickerel subpopulation becomes not viable is unknown.

Generally, there has been little recent change in the overall amount or quality of habitat as most of the habitat was already degraded, particularly in systems that also function as agricultural drains. The habitat in the Severn River drainage has been highly degraded by cottage development resulting in limited suitable habitat available. Suitable, un-degraded habitat within this drainage now primarily exists in the undeveloped Grass Lake portion of the watershed, which is located about 20 km north of Lake Simcoe (Colm, unpubl. data).

Threats:

Change in nature and/or severity of threats: yes ☒ no☐ unk ☐

Explanation:

In addition to the threats listed in the 2005 status report, two invasive species are potential new threats to Grass Pickerel in Canada. The ecologically similar Chain Pickerel (*Esox niger*) is native only to Québec in Canada, but appears to be expanding into the range of the Grass Pickerel in Ontario, probably from populations in adjacent portions of New York State (Hoyle and Lake 2011). Since 2009, 14 verified Chain Pickerel specimens have been caught in eastern Lake Ontario. It is thought that climate change may facilitate its further expansion into Ontario from waterways in New York (Mandrak 1989; Hoyle and Lake 2011). The larger Chain Pickerel could be a competitor for (or even predator of) the Grass Pickerel, as it tends to inhabit the same types of habitats (i.e. slow-moving, heavily vegetated, warm-water streams). Although the ranges of the Chain Pickerel and Grass Pickerel overlap in parts of the USA (Page and Burr 2011), little has been reported on their interactions. Chain Pickerel is known to be invasive where it has been introduced in eastern Canada (Connell *et al.* 2002). An invasive plant species, the European Common Reed (*Phragmites australis australis*) forms dense monotypic stands and is a superior competitor relative to native plant species (Gilbert and Locke 2007). European Common Reed is found in high abundance in Lake Erie wetlands and is not only reducing the native plant diversity but also, in high density stands, possibly also reducing the amount of available habitat for Grass Pickerel. Under climate change, impacts such as increases in water and air temperatures, changes (decreases) in water levels, shortening of the duration of ice cover, increases in the frequency of extreme weather events, emergence of diseases, and shifts in predator-prey dynamics may negatively impact native fishes (Lemmen and Warren 2004). Based on an evaluation of the effects of climate change on the habitat of coastal wetland fishes in the Great Lakes, Doka *et al.* (2006) concluded that Grass Pickerel populations in such habitats were highly vulnerable to climate change.

Urbanization was identified as a threat in the 2005 report, which should now include cottage development, particularly in the Severn River drainage (Colm, unpubl. data).

Protection:

Change in effective protection: yes ☒ no ☐

Explanation:

Grass Pickerel is not valued as a commercial or recreational fish species, or one of particular interest for Aboriginal fisheries; therefore, with recent changes to the federal *Fisheries Act* taking effect, it will lose some of the protection afforded to it and its habitat.

In Québec, the Grass Pickerel is now on the Liste des espèces susceptibles d'être désignées menacées ou vulnérables (list of wildlife species likely to be designated threatened or vulnerable). This list is produced according to the *Loi sur les espèces menacées ou vulnérables* (RLRQ, c E-12.01) (LEMV) (Act respecting threatened or vulnerable species) (CQLR, c E-12.01). Essentially preventive in nature, the list of species liable to be designated as threatened or vulnerable is an administrative and educational device designed to slow or even reverse the process of declines in abundance of species at risk. The species appearing in the list will be the subject of particular attention in the case of any project subject to assessment by environmental authorities under sections 22 and 31.1 of the Québec *Environment Quality Act*. The directives that are communicated to the promoters of these projects will take listed species into account.

Rescue Effect:

Change in evidence of rescue effect: yes ☐ no ☒

Explanation:

Rescue from bordering states of the USA is still unlikely, but possible. There has been no apparent change in conservation status in the USA: (New Jersey (SNR), West Virginia (S1S2)) (Nature Serve 2013).

Quantitative Analysis:

Change in estimated probability of extirpation: yes ☐ no ☐ unk ☒

Details:

Data not available.

Summary and Additional Considerations: [e.g., recovery efforts]

Recent finds of Grass Pickerel in Québec are encouraging, but occurrences are sporadic despite targeted sampling in the historical location. There is evidence to suggest declines of mature individuals in some Ontario populations (Beaver Creek, Jones Creek, Twenty Mile Creek; DFO sampling efforts); populations in the St. Clair drains and most coastal regions of lakes Erie and Ontario and the St. Lawrence River appear to be at least stable. Grass Pickerel was recently caught in the lower Niagara River for the first time in October 2014 (DFO, unpubl. data). Other populations have not been sampled recently so population size and trends cannot be estimated. New likely threats to the Grass Pickerel, include two invasive species, Chain Pickerel and *Phragmites*, and climate change. Recent efforts such as the drain maintenance best practices guide (Coker *et al.* 2010) described below, however, may help to mitigate some of the previously known threats to Grass Pickerel and its habitat (see below).

Recovery efforts since 2005:

A DFO management plan was developed for Grass Pickerel in 2012 with the main goal to prevent this species of Special Concern from becoming Threatened or Endangered. Specific habitat requirements are outlined, as are threats to the species and its habitat, and actions to be taken (Beauchamp *et al.* 2012).

In 2010, a science advice guide was published through DFO to help mitigate the effects of drain maintenance on Grass Pickerel (Coker *et al.* 2010). The following topics were addressed: direct destruction and alteration of habitat; pollution and degradation of water quality; siltation of wetlands and watercourses; low water levels; and diversion of cold or cool water into Grass Pickerel habitat. The mechanisms and potential impacts of these issues were discussed, followed by suggestions for alternative practices and mitigation.

Since 2007, at least 16 projects with Grass Pickerel as one of the target species have been funded through the Ontario OMNRF SAR Stewardship Fund. These projects have focused on protecting communities with species at risk by enhancing habitat (from riparian zones to water quality), monitoring, and providing education and community outreach (K. Jaxa-Debicki, OMNRF, pers. comm.).

Some populations of Grass Pickerel may have benefited indirectly from conservation efforts targeting higher priority, co-existing species funded through the Federal Habitat Stewardship Fund, but there are as yet no empirical data to evaluate the potential effects of these projects (S. Dunn, DFO, pers. comm.).

Acknowledgements and authorities contacted:

DFO Ontario: Lynn Bouvier, Andrew Doolittle, Shelly Dunn, Bill Glass, Shawn Staton

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COSEWIC Secretariat: Neil Jones, Sonia Schnobb

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Parks Canada: Valerie Minelga, Josh Van Wieren (c/o Dr. Patrick Nantel)

CWS Ontario: Greg Grabas (c/o Rich Russell)

CWS Québec: Gilles Falardeau (c/o François Fournier)

OMNRF: Sarah Hogg (c/o Vivian Brownell), Kim Jaxa-Debicki, Colin Lake, Tom MacDougall, Kurt Oldenburg, Steve Scholten, Anne Yagi

Ministère des Forêts, de la Faune et des Parcs (MFFP): Marc-Antoine Couillard (c/o Isabelle Gauthier); ROM: Erling Holm; Queen's University: John Casselman, Bruce Tufts

Grand River CA: Crystal Allan

Long Point Region CA: Paul Gagnon

Quinte Conservation: Brad McNevin; Raisin Region CA: Brendan Jacobs; South Nation Conservation: Naomi Langlois-Anderson (c/o Nick Mandrak); St. Clair Region CA: Erin Carroll

Special thanks to Andrew Doolittle and Lynn Bouvier of DFO for the production of EO and IAO maps.

Information sources:

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TECHNICAL SUMMARY

Esox americanus vermiculatus

Grass Pickerel Brochet vermiculé

Range of occurrence in Canada: Ontario, Québec

Demographic Information

Generation time (usually average age of parents in the population; indicate if another method of estimating generation time indicated in the IUCN guidelines(2011) is being used)	3-4 yrs
Is there an [observed, inferred, or projected] continuing decline in number of mature individuals? It is likely that the number of mature individuals has declined and continues to decline in some populations, but no quantification of these potential declines is possible.	Perhaps
Estimated percent of continuing decline in total number of mature individuals within [5 years or 2 generations] Not enough information available at this time.	Unknown
[Observed, estimated, inferred, or suspected] percent [reduction or increase] in total number of mature individuals over the last [10 years, or 3 generations]. There may have been a decline in Québec because, until the summer of 2014, no individuals had been detected since 1988. The detections in 2014 were only in one (Lake St. Francis) of two areas (the other being Lac St-Louis) of historical occurrence in Québec. There was likely a decline in some Ontario subpopulations over the last 10 years (Beaver Creek, Twenty Mile Creek, Jones Creek).	Unknown (Observed or inferred for some subpopulations)
[Projected or suspected] percent [reduction or increase] in total number of mature individuals over the next [10 years, or 3 generations]. Not enough information available.	Unknown
[Observed, estimated, inferred, or suspected] percent [reduction or increase] in total number of mature individuals over any [10 years, or 3 generations] period, over a time period including both the past and the future. Not enough information available.	Unknown
Are the causes of the decline a. clearly reversible and b. understood and c. ceased? Although many of the causes of historical declines are not reversible, they may be preventable in the future, thereby making rescue attempts feasible. In Ontario, causes of historical decline and threats to Grass Pickerel and its habitat are relatively well understood, and are generally centred on agricultural drain maintenance practices. These problems have not ceased, although mitigation efforts to reduce the impacts from drain maintenance are being put in place in some southern Ontario locations.	NA, no conclusive evidence of recent decline across the range

Similarly, it is thought that the main cause of decline in Québec is urbanization and the resulting loss of aquatic and riparian vegetation and elevated turbidity (AECOM, 2013). This is not likely to be reversible, but could be mitigated in the future.	
Are there extreme fluctuations in number of mature individuals? Data have not been collected consistently enough across subpopulations, but it seems unlikely given the data that are available. The most extensive targeted sampling is that in Beaver Creek led by DFO. A 5-year study was conducted and preliminary data suggest there may have been a decline in the number of mature individuals throughout the last 3 years of the study, but it is unclear whether this could be within the natural range of variation. Data from regular broad-scale sampling in eastern Lake Ontario and the St. Lawrence River (efforts from MNR, Muskies Canada, and 1000 Islands National Park) suggest that the number of mature individuals has remained relatively constant over the last 10 years.	Unlikely

Extent and Occupancy Information

Estimated extent of occurrence Note that 2004-2013 value is based on verified records of Grass Pickerel during that time period. Note: the "pre-2004' estimate includes records from 1994-2003 (most recent 10 years) and all previous records. *86,846 km² (2004-2014) 61,967 km² (1994-2003) 91,768 km² (pre 2004)	~86,846.4 km²
Index of area of occupancy (IAO) (Always report 2x2 grid value). It should be noted that the area of occupancy of 683km² reported in the 2005 status report was likely not calculated using a 2x2 grid. Also, the 2004-2014 value is based on verified records of Grass Pickerel during that time period. Note: the "pre-2004' estimate includes records from 1994-2003 (most recent 10 years) and all previous records. 427km² (2004-2014) 280 km² (1994-2003) 558 km² (pre-2004)	~427 km²
Is the population "severely fragmented" i.e., >50% of its total area of occupancy is in habitat patches that are (a) smaller than would be	No

required to support a viable population, and (b) separated from other habitat patches by a large distance? The last status report suggested that the subpopulations in 9 out of 10 sites were significantly isolated from one another. Although very few Grass Pickerel have been caught recently in Québec, that location is at the eastern end of the range in Canada, and thus no further fragmentation is occurring. There has been no significant change in distribution of locations in Ontario.	
Number of locations* (use plausible range to reflect uncertainty) Historically, there were nine Ontario locations and one Québec location. Number of locations is now slightly higher owing to a new understanding of the meaning of the term "locations".	15
Is there an [observed, inferred, or projected] continuing decline in extent of occurrence? An increase was observed owing to increased sampling efforts probably not actual population expansion	No
Is there an [observed, inferred, or projected] continuing decline in index of area of occupancy? An increase was observed likely as a result of increased sampling efforts probably not actual range expansion.	No
Is there an [observed, inferred, or projected] continuing decline in number of subpopulations? An increase was observed likely as a result of increased sampling efforts probably not actual range expansion.	No
Is there an [observed, inferred, or projected] continuing decline in number of locations*? Fish from the Québec occurrences (one location) have only been observed sporadically since 1988; however, the occurrences (at least 14 locations) in Ontario seem relatively stable.	No
Is there an [observed, inferred, or projected] continuing decline in [area, extent and/or quality] of habitat? With recent attempts to mitigate impacts from drain maintenance on Grass Pickerel habitat, it is unlikely that there will be further decline in area, extent of, or quality of habitat in areas affected by agriculture. Habitat area, however, will likely decline in Lake Erie coastal wetlands as the invasive *Phragmites* transforms aquatic habitat into semi-aquatic habitat not suitable for Grass Pickerel.	Probably
Are there extreme fluctuations in number of subpopulations? There are no data to suggest this.	No
Are there extreme fluctuations in number of locations*?	No

* Defined on basis of common threats - see Definitions and Abbreviations on COSEWIC website and IUCN 2010 for more information on this term.

Are there extreme fluctuations in extent of occurrence?	No
Are there extreme fluctuations in index of area of occupancy?	No

Number of Mature Individuals (at each location)

Location (most plausible threat)	N Mature Individuals
Severn River Drainage (cottage development [excluding Grass Lake])	Unknown
Grass Lake (no apparent threat)	Unknown
Old Ausable Channel (residential development)	Unknown
Lower Grand River (drain maintenance invasive plants)	Unknown
Lake St. Clair area; Walpole Island, Little Bear Creek: wetland draining in Bear Creek)	Unknown
Lake Erie Western Basin, including Point Pelee, Holiday Beach (invasive plants)	Unknown
Long Point (invasive plants)	Unknown
Upper Niagara River Drainage (urbanization)	several 1000
Lower Niagara River main stem (pollution and wetland loss)	unknown
Twenty Mile Creek (urbanization)	Unknown
Upper Welland River (urbanization)	
Eastern Lake Ontario: no likely threat	Unknown
Upper St. Lawrence River (above fall line) - Jones Creek and upper Gananoque River (no identified threat)	Unknown
Upper St. Lawrence River (below fall line; urbanization, agriculture)	Unknown
Lake St. Francis to Lac St-Louis: (habitat modification and dams)	Unknown
Total	Unknown

Quantitative Analysis

Probability of extinction in the wild is at least [20% within 20 years or 5 generations, or 10% within 100 years]. Not enough data available at this time.	Unknown

Threats (actual or imminent, to populations or habitats)

Threats that remain the same as those in 2005 status report:
- urbanization and agriculture practices through effects on reduction in flow and channelization and pollution through herbicides and pesticides
- siltation
- removal of vegetation
- low water levels caused by water extraction, and drought
- diversion of cold or cool water into Grass Pickerel habitat (from Welland Canal into Lyons Creek)
- destruction and degradation of wetland habitat

Additional threats to consider:
- potential range expansion of Chain Pickerel into eastern Lake Ontario

* Defined on basis of common threats - see Definitions and Abbreviations on COSEWIC website and IUCN 2010 for more information on this term.

- cottage development, particularly in the Severn drainage - *Phragmites* in Great Lakes coastal wetlands, most notably in Lake Erie - climate change

Rescue Effect (immigration from outside Canada)

Status of outside population(s) most likely to provide immigrants to Canada? Status of Grass Pickerel in adjacent states of USA is S1S2 or SNR, of least concern. Globally, the Grass Pickerel is still listed as G5T5, and nationally in the USA it is listed as N3. These codes indicate the species is secure globally and nationally in the USA.	New Jersey (SNR) West Virginia (S1S2)
Is immigration known or possible? The Grass Pickerel is known from tributaries of lakes Erie and Ontario and in the St. Lawrence River on the USA side. Although individuals would be unlikely to travel such distances, it is possible in perhaps 5 of the 15 locations (e.g., Upper St. Lawrence River).	Yes
Would immigrants be adapted to survive in Canada? Populations on the USA side of the Great Lakes likely share similar adaptations to those on the Canadian side.	Yes
Is there sufficient habitat for immigrants in Canada?	Yes
Is rescue from outside populations likely?	Probably not

Data-Sensitive Species

Is this a data-sensitive species? No

Status History

COSEWIC: Designated Special Concern in May 2005. Status re-examined and confirmed in November 2014.

Status and Reasons for Designation

Status:	**Alpha-numeric Code:**
Special Concern	Not Applicable
Reasons for Designation: This fish is known from relatively few locations from southern Lake Huron to western Québec. The subspecies has a scattered distribution in Canada and is not abundant in any area. The subspecies could become threatened if habitat quality continues to decline owing to changes in land use and invasive species.	

Applicability of Criteria

Criterion A: Not applicable. Criteria cannot be assessed owing to lack of appropriate data.
Criterion B: Meets Threatened B2 as IAO (427 km^2) is less than 500 km^2, but number of locations (15) exceeds threshold (10) and there is no evidence of continuing decline in number of mature individuals, or in extent or quality of habitat across the range.
Criterion C: Not applicable. Criteria cannot be assessed owing to lack of relevant data.

Criterion D: Not applicable, all thresholds exceeded.
Criterion E: Not applicable. Criteria cannot be assessed owing to lack of relevant data.

Additional Sources of Information:

AECOM. 2013. Inventaire et caractérisation des habitats utilisés au printemps par le brochet vermiculé dans l'aire de répartition historique du fleuve Saint-Laurent et ses affluents. Présenté à Pêches et Océans Canada. 32 pages et annexes.

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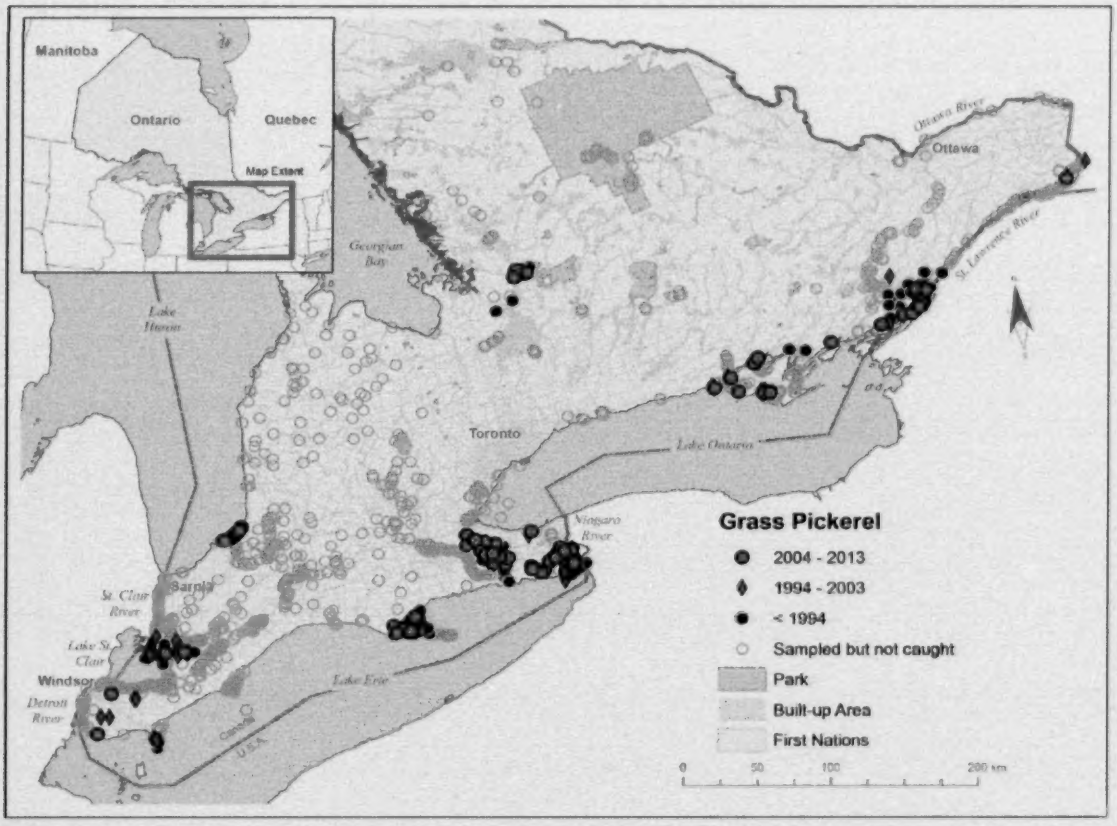

Figure 1. Current distribution of Grass Pickerel in Canada. Note that the summer 2014 captures of Grass Pickerel in Lake St. Francis, Québec, and the lower Niagara River, Ontario, are not shown on the map (but see Fig. 2 and 3).

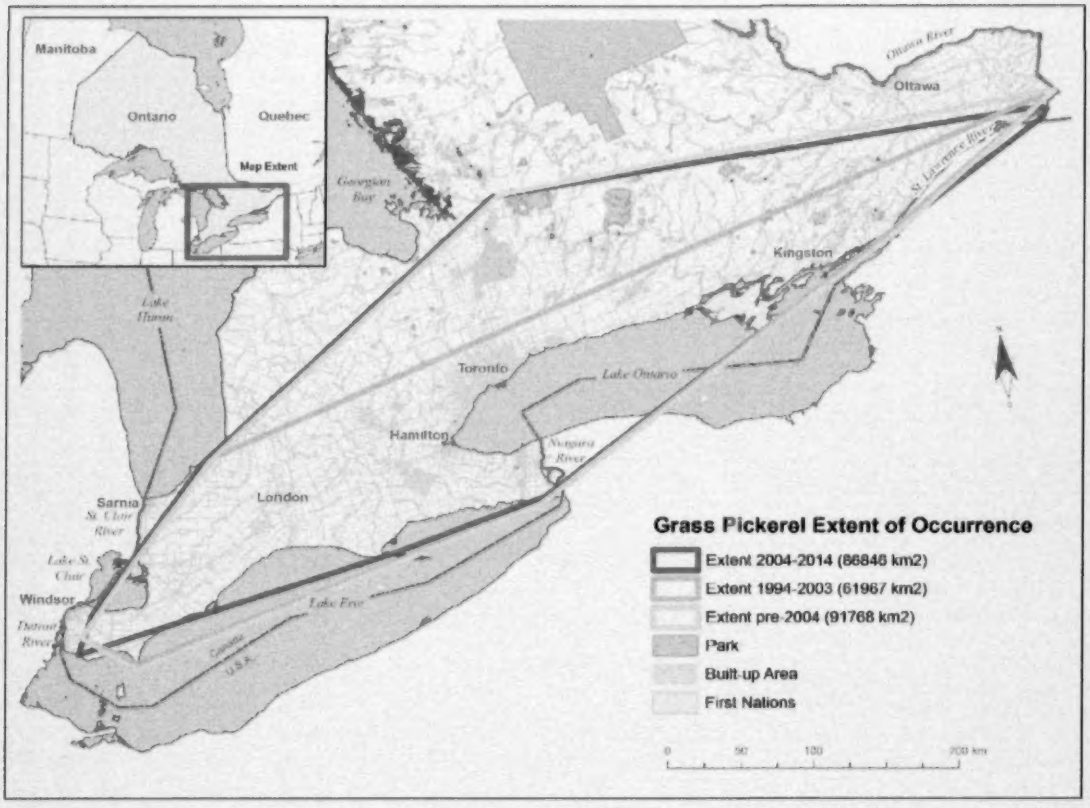

Figure 2. Extent of occurrence for Grass Pickerel in Canada.

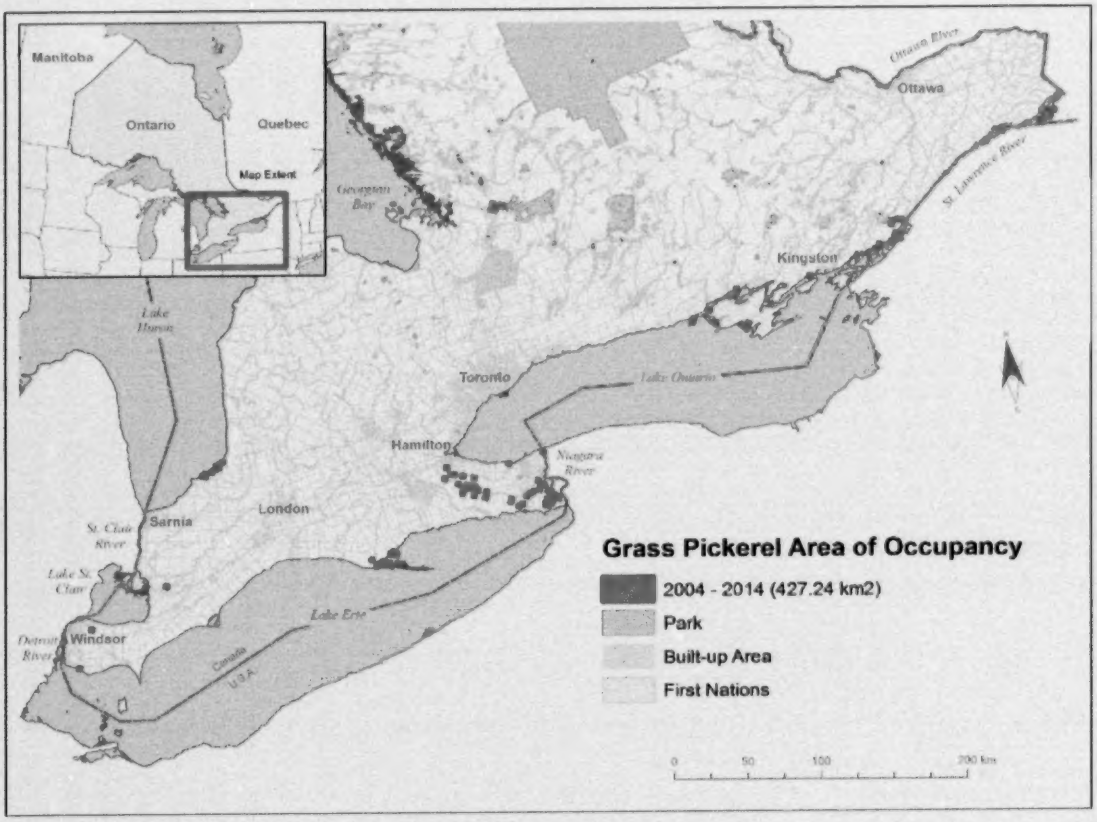

Figure 3. Area of occupancy for Grass Pickerel in Canada, 2004-2014.

COSEWIC HISTORY

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) was created in 1977 as a result of a recommendation at the Federal-Provincial Wildlife Conference held in 1976. It arose from the need for a single, official, scientifically sound, national listing of wildlife species at risk. In 1978, COSEWIC designated its first species and produced its first list of Canadian species at risk. Species designated at meetings of the full committee are added to the list. On June 5, 2003, the *Species at Risk Act* (SARA) was proclaimed. SARA establishes COSEWIC as an advisory body ensuring that species will continue to be assessed under a rigorous and independent scientific process.

COSEWIC MANDATE

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assesses the national status of wild species, subspecies, varieties, or other designatable units that are considered to be at risk in Canada. Designations are made on native species for the following taxonomic groups: mammals, birds, reptiles, amphibians, fishes, arthropods, molluscs, vascular plants, mosses, and lichens.

COSEWIC MEMBERSHIP

COSEWIC comprises members from each provincial and territorial government wildlife agency, four federal entities (Canadian Wildlife Service, Parks Canada Agency, Department of Fisheries and Oceans, and the Federal Biodiversity Information Partnership, chaired by the Canadian Museum of Nature), three non-government science members and the co-chairs of the species specialist subcommittees and the Aboriginal Traditional Knowledge subcommittee. The Committee meets to consider status reports on candidate species.

DEFINITIONS
(2014)

Wildlife Species	A species, subspecies, variety, or geographically or genetically distinct population of animal, plant or other organism, other than a bacterium or virus, that is wild by nature and is either native to Canada or has extended its range into Canada without human intervention and has been present in Canada for at least 50 years.
Extinct (X)	A wildlife species that no longer exists.
Extirpated (XT)	A wildlife species no longer existing in the wild in Canada, but occurring elsewhere.
Endangered (E)	A wildlife species facing imminent extirpation or extinction.
Threatened (T)	A wildlife species likely to become endangered if limiting factors are not reversed.
Special Concern (SC)*	A wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.
Not at Risk (NAR)**	A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.
Data Deficient (DD)***	A category that applies when the available information is insufficient (a) to resolve a species' eligibility for assessment or (b) to permit an assessment of the species' risk of extinction.

* Formerly described as "Vulnerable" from 1990 to 1999, or "Rare" prior to 1990.

** Formerly described as "Not In Any Category", or "No Designation Required."

*** Formerly described as "Indeterminate" from 1994 to 1999 or "ISIBD" (insufficient scientific information on which to base a designation) prior to 1994. Definition of the (DD) category revised in 2006.

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Canada

The Canadian Wildlife Service, Environment Canada, provides full administrative and financial support to the COSEWIC Secretariat.